



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/813,799

03/31/2004

Yi-Ling Chen

N1085-00131

7559

54657 7590 04/13/2007

DUANE MORRIS LLP  
IP DEPARTMENT (TSMC)  
30 SOUTH 17TH STREET  
PHILADELPHIA, PA 19103-4196

EXAMINER

NGUYEN, SANG H

ART UNIT

PAPER NUMBER

2886

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
--	-----------	---------------

3 MONTHS

04/13/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/813,799	<b>Applicant(s)</b> CHEN, YI-LING	
	<b>Examiner</b> Sang Nguyen	<b>Art Unit</b> 2886	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 26 February 2007.
- 2a) ☒ This action is FINAL.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Amendment***

Applicant's response to remarks filed on 02/26/07 has been entered. It is noted that the application contains claims 1-16 by the amendment on 02/26/07.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1-7 and 10-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al (U.S. Patent No. 7,006,205) in view of Hwang et al (U.S. Patent No. 6,024,831) and Background of Present Invention (paragraph [0002] to paragraph [0007]).**

**Regarding claims 1 and 14-15;** Agarwal et al discloses a method of monitoring of particles, the method comprising the steps of:

exciting the particles (col.5 lines 60-65) to emit light (116 of figure 1) by a plasma passes through a window (124 of figure 1), wherein the emitted light (116 of figure 1) having a predetermined wavelength (i.e., a specific wavelength [see col.5. lines 62-65]) associated with the particles (col.5 line 60 to col.6 line24 and table 1); and

measuring intensity values of the light emitted (116 of figure 1) at the predetermined wavelength over a predetermined time period by a spectrometer (120 of figure 1 and col.5 lines 40-45); and

comparing the measured intensity value of the emitted light (116 of figure 1) with a correct plasma characterization by a neural network (122 of figure 1). See figures 1-13.

Agarwal et al discloses all of features of claimed invention except for particles generated by the reaction by product film peeling from the interior wall of the reaction chamber of the semiconductor fabrication apparatus. However, Background of the Present Invention teaches that it is known in the art to provide particles generated by the reaction by product film peeling from the interior wall of the reaction chamber of the semiconductor fabrication apparatus (paragraphs [0003] – [0004]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method of monitoring of particles with particles generated by the reaction by product film peeling from the interior wall of the reaction chamber of the semiconductor fabrication apparatus as taught by Background of the Present Invention for the purpose of performing a maintenance cleaning on the chamber to remove the

adhering peeling film and monitoring the concentration of particles in the reaction chamber.

U.S. Patent Feb. 28, 2006 Sheet 1 of 12 US 7,006,205 B2

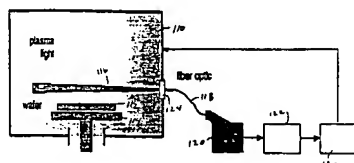


FIG. 1

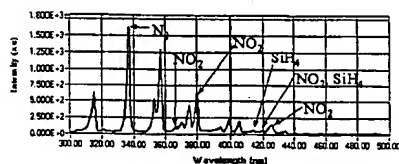


FIG. 2

U.S. Patent Feb. 15, 2000 Sheet 1 of 9 6,024,831

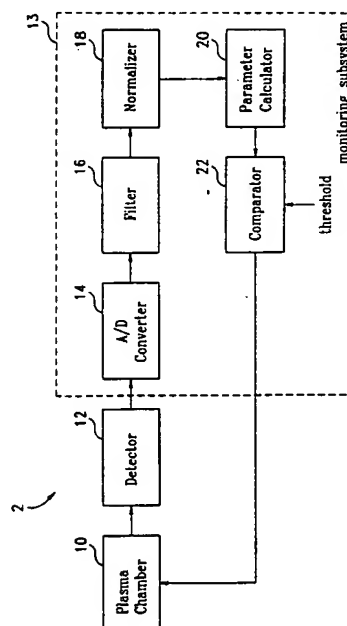


FIG. 1

Agarwal et al discloses all of features of claimed invention except for comparing the intensity value of the light, measured at a selected time during the predetermined time period, to a predetermined light intensity threshold value wherein if the intensity value of the light measured at the selected time is above the predetermined light intensity threshold value, the chamber condition is abnormal. However, Hwang et al teaches that it is known in the art to provide method for monitoring plasma chamber conditions comprises a monitoring subsystem (13 of figure 1) coupled to a detector spectrometer (12 of figure 1), wherein the monitoring subsystem (13 of figure 1) having

Art Unit: 2886

a comparator (22 of figure 1) and a parameter calculator (20 of figure 1) for comparing the measured intensity value of the light from detector (12 of figure 1) at a selected time during the predetermined time period to a predetermined light intensity threshold value (col.1 lines 50-52 and figure 1) wherein if the intensity value of the light measured at the selected time is above the predetermined light intensity threshold value, the chamber condition is abnormal (col.1 line 50 to col.2 line 2; col.3 line 55 to col.4 line 10; and col.5 line 45 to col5 line3). See figures 1-6.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method of monitoring of particles with comparing the intensity value of the light, measured at a selected time during the predetermined time period, to a predetermined light intensity threshold value wherein if the intensity value of the light measured at the selected time is above the predetermined light intensity threshold value, the chamber condition is abnormal as taught by Hwang et al for the purpose of monitoring accuracy processing chamber during in the plasma.

**Regarding claims 2 and 16;** Agarwal et al discloses all of features of claimed invention except for the comparing step if the intensity value of the light is equal to or below the predetermined light intensity threshold value, the chamber condition is normal. However, Hwang et al teaches that it is known in the art to provide the comparing step if the intensity value of the light is equal to or below the predetermined light intensity threshold value, the chamber condition is normal (figures 3 and \$a-4D and col.col.2 lines 15-16)). It would have been obvious to one having ordinary skill in the art

Art Unit: 2886

at the time the invention was made to combine Agarwal et al's method of monitoring of particles with the comparing step if the intensity value of the light is equal to or below the predetermined light intensity threshold value, the chamber condition is normal as taught by Hwang et al for the purpose of monitoring accuracy processing chamber during in the plasma.

**Regarding claim 3;** Agarwal et al discloses the selected time during the predetermined time period (figures 6 and 9). Agarwal et al discloses all of features of claimed invention except for the selected time about one-half the predetermined time period. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method of monitoring of particles with the selected time about one-half the predetermined time period, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

**Regarding claim 4;** Agarwal et al discloses all of features of claimed invention except for the exciting step is performed by generating RF power within the chamber. However, Hwang et al teaches that it is known in the art to provide generating RF power within the chamber (col.2 lines 28-32). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method of monitoring of particles with generating RF power within the chamber as taught by Hwang et al for the purpose of monitoring accuracy processing chamber during in the plasma in IC fabrication processes.

**Regarding claim 5;** Agarwal et al discloses all of features of claimed invention except for further performed by pumping a process gas into the chamber. However, Hwang et al teaches that it is known in the art to provide performed by pumping a process gas into the chamber (col.2 line 28). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method of monitoring of particles with performed by pumping a process gas into the chamber as taught by Hwang et al for the purpose of monitoring accuracy processing chamber during in the plasma in IC fabrication processes.

**Regarding claim 6;** Agarwal et al discloses the measuring step is performed by observing the emitted light by an optical emission spectrometer (118, 120 of figure 1).

**Regarding claim 7;** Agarwal et al discloses the semiconductor fabrication apparatus comprises a plasma etching apparatus (col.11 lines 24-35).

**Regarding claim 10;** Agarwal et al discloses the predetermined wavelength is about 703 nanometers (col.6 lines 1-20 in dicated wavelength may be 300 nm to 750 nm and figure 2).

**Regarding claim 11;** Agarwal et al discloses further comprising the step of storing the intensity value of the light measured of spectrometer (120 of figure 1) at the selected time in a trend file by a neural network (122 of figure 1).

**Regarding claim 12;** Agarwal et al discloses further comprising the step of graphically displaying the intensity value of the light stored in the trend file on a user interface (figures 5-6 for indicating intensity light of training set 571, validation set 573, and test set 575).



**Regarding claim 13;** Agarwal et al discloses using data obtained from the trend file for inline process control by a controller system (130 of figure 1).

**Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwal et al and Hwang et al as applied to claims 1 and 7 above, and further in view of Wong et al (6815362).**

**Regarding claims 8-9;** Agarwal et al in view of Hwang et al discloses all of features of claimed invention except for the exciting step is a stage of a waferless auto-clean cycle of the apparatus. However, Wong et al teaches that it is known in the art to provide a stage of a waferless auto-clean cycle of the apparatus (figure 10). It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine Agarwal et al's method of monitoring of particles with the exciting step is a stage of a waferless auto-clean cycle of the apparatus as taught by Wong et al for the purpose of removing previously deposited chamber residues which has accumulated on interior surface of chamber.

### ***Response to Arguments***

Applicant's arguments filed on 02/26/07 have been fully considered but they are not persuasive. Applicant argued, pages 2-5, that Agarwal and Hwang references and Background of Present Invention fail to "cure the deficiencies or some suggestion or motivation" or "the rejection fails to establish *prima facie* obviousness and not combine with prior art of the present invention" as recited in claims 1 and 14. Also, Agarwal and Hwang references and Background of Present Invention fail to teach or suggest "a method of in situ monitoring of particles generated by a reaction by-product film peeling

from an interior wall of a reaction chamber of a semiconductor fabrication apparatus to determining reaction chamber condition" as recited in claims 1 and 14.

This argument is not persuasive.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Agarwal and Hwang references and Background of Present Invention have the same function or result for the purpose of using a method and apparatus for monitoring particles or defects by a processing plasma for maintenance cleaning on the chamber during monitoring particles in the reaction chamber and monitoring accurately particles during

processing plasma to the chamber. Also, the applicant argues that Agarwal and Hwang references and Background of Present Invention fail to teach or suggest "a method of in situ monitoring of particles generated by a reaction by-product film peeling from an interior wall of a reaction chamber of a semiconductor fabrication apparatus to determining reaction chamber condition". As stated in previous Office action at pages 2-5 on 11/24/06 (see above), Agarwal et al discloses a method of monitoring of particles, the method comprising the steps of exciting the particles (col.5 lines 60-65) to emit light (116 of figure 1) by a plasma passes through a window (124 of figure 1), wherein the emitted light (116 of figure 1) having a predetermined wavelength (i.e., a specific wavelength [see col.5. lines 62-65]) associated with the particles (col.5 line 60 to col.6 line 24 and table 1), measuring intensity values of the light emitted (116 of figure 1) at the predetermined wavelength over a predetermined time period by a spectrometer (120 of figure 1 and col.5 lines 40-45), and comparing the measured intensity value of the emitted light (116 of figure 1) with a correct plasma characterization by a neural network (122 of figure 1). However, Background of the Present Invention teaches that it is known in the art to provide particles generated by the reaction by product film peeling from the interior wall of the reaction chamber of the semiconductor fabrication apparatus (paragraphs [0003] – [0004]). Also, However, Hwang et al teaches that it is known in the art to provide method for monitoring plasma chamber conditions comprises a monitoring subsystem (13 of figure 1) coupled to a detector spectrometer (12 of figure 1), wherein the monitoring subsystem (13 of figure 1) having a comparator (22 of figure 1) and a parameter calculator (20 of figure 1) for comparing the measured intensity value of the

Art Unit: 2886

light from detector (12 of figure 1) at a selected time during the predetermined time period to a predetermined light intensity threshold value (col.1 lines 50-52 and figure 1) wherein if the intensity value of the light measured at the selected time is above the predetermined light intensity threshold value, the chamber condition is abnormal (col.1 line 50 to col.2 line 2; col.3 line 55 to col.4 line 10; and col.5 line 45 to col5 line3). Thus, the references are considered in combination, the recitation of the claims would have been obvious suggested.

In response to applicant's arguments, the recitation "a method of in situ monitoring of particles" has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951).

For the reasons set forth above the arguments, it is believed that the rejection of the claims 1-16 under 35 U.S.C 103 (a) is proper.

### **Conclusion**

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kikuchi et al (5226056) discloses plasma ashing method and apparatus.

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sang Nguyen whose telephone number is (571) 272-2425. The examiner can normally be reached on 9:30 am to 7:00 pm.

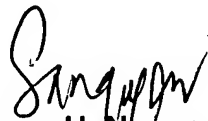
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tarifu Chowdhury can be reached on (571) 272-2800 ext. 86. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

Art Unit: 2886

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

April 8, 2007

  
**Sang H. Nguyen**  
**Primary Patent Examiner**  
**Art Unit 2877**